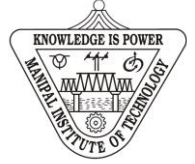


Reg. No.

# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



## VI SEMESTER B.TECH (COMPUTER SCIENCE AND ENGINEERING) MAKE UP EXAMINATIONS, JULY 2016

### SUBJECT: PARALLEL COMPUTER ARCHITECTURE AND PROGRAMING [CSE 306]

#### REVISED CREDIT SYSTEM

Time: 3 Hours

1-7-2016

MAX. MARKS: 50

#### Instructions to Candidates:

- ❖ Answer **ANY FIVE FULL** questions.
- ❖ Missing data, if any, may be suitably assumed.

1A. What are needs of Parallel Computing? (2M)

1B. Give Feng's Classification of Computer Architecture.. (4M)

1C. Consider the execution of a program of 15000 instructions by linear pipeline processor. The clock rate of pipeline is 25 MHz. Pipeline has five stages and one instruction is issued per cycle. Neglect penalties due to branch instructions and out of sequence execution.

- a) Calculate the speed up program execution by pipeline as compared with that of non pipelined processor. (2M)
- b) What are the efficiency and throughput of the pipeline processor? (2M)

2A. Consider the reservation table given in Table 2A

	1	2	3	4
S1	x			x
S2		x		
S3			x	

Table 2A

- (i) Give the State Diagram.
- (ii) Give Simple Cycles and Greedy Cycles.
- (iii) Calculate MAL.
- (iv) Evaluate Minimum Greedy Cycle Average Latency. (5M)

2B. What do you mean by Platform, Device and Command Queue? Explain with an example.

(2M)

2C. What are Cache Coherence Protocols? Explain with it's types?

(3M)

3A. Write a MPI program to read matrix A of size 5x5. It produces a resultant matrix B of size 5x5. It sets all the principal diagonal elements of B matrix with 0. It replaces **each row** of B matrix in the following manner: If the element is below the principal diagonal it replaces it

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with the maximum value of the column in the A matrix having the same row number of B. If the element is above the principal diagonal it replaces it with the minimum value of the column in the A matrix having the same row number of B. Produce the B Matrix using 5 processes. Use Collective communication routines.

Example:

A					B				
1	2	3	4	5	0	1	1	1	1
5	4	3	2	1	22	0	2	2	2
10	3	13	14	15	13	13	0	3	3
11	22	11	33	44	33	33	33	0	2
1	12	5	4	6	44	44	44	44	0

( 5 M )

3B. How are Data Dependence and Name Dependence Caused? Explain with an example. ( 2 M )

3C. Perform SIMD addition for 8 numbers in 8 PE'S, showing all the steps.

PE0	PE1	PE2	PE3	PE4	PE5	PE6	PE7
1	2	3	4	5	6	7	8

( 3 M )

4 An OpenCL program reads two strings *S1* and *S2* having **equal number of words**. It produces an output string *res* by concatenating the two input strings as shown below.

Example:

Input strings: **S1:** Good How you **S2:** morning are guys

Output string **res:** **Goodmorning Howare youguys**

A. Write the kernel code which produces every word of output string *res* in parallel. ( 4 M )

B. i) Create all the buffers required for this program. ( 3 M )

ii) Create the kernel object and set all the arguments to the kernel written in A.

C. i) Set the global work size of this program.

ii) Write the OpenCL statement to execute this kernel. ( 3 M )

5A. Suppose  $f(A)$  and  $f(B)$  are two functions, with A and B as parameters. Perform  $f(A) + f(B)$ , using two process's in shared memory mode, and variable sum. ( 3 M )

5 B. What is VLIW architecture? What are its advantages and disadvantages? ( 3 M )

5 C. ( i ) What do you mean by collective communication in MPI? Explain with syntax. (2M)

( ii ) What is Work dimension in Open CL? Give the commands to get id's of work items.

(2M)

6 A. Explain the two classes of MIMD multiprocessors, with diagrams. ( 3 M )

6 B. Describe the two methods for inter processor communication for multi processor, with diagrams.

( 3 M )

6 C. Write the Open CL Memory Model, showing all the components. What do you mean by Global Item Size and Local Item Size? Explain with an example. ( 4 M )